MEMORANDUM

DATE: May 19, 2003

TO: Division of Shellfish Sanitation Staff

FROM: Robert E. Croonenberghs, Ph.D., Director
Division of Shellfish Sanitation

THROUGH: Eric H. Bartsch, P.E., Director
Office of Water Programs

SUBJECT: Seawater Sampling - Procedure - Safety Protocol for Seawater Sampling Program

## ***PURPOSE***

The objectives of this protocol are:

1. To establish a clear determination of exposure and risk in DSS over the water activities in relation to Pfiesteria.

2. To establish a voluntary safety program for shellfish specialists during routine seawater sampling

3. To facilitate the necessary certifications required to use specific safety gear.

## ***INTRODUCTION***

The Division has participated in the Pfiesteria Safety Committee. The Pfiesteria Safety Committee is made up of the Department of Environmental Quality, the Virginia Marine Resources Commission, the Virginia Institute of Marine Science and the Virginia Department of Health. These agencies are involved in over-the-water activities. This committee was charged with developing a safety policy for state workers who work over the water. This committee determined that routine activities of state agencies who have employees working over the water do not result in an exposure to Pfiesteria toxins.

The National Institute of Occupational Safety and Health (NIOSH) has indicated that in a fish kill, mucous membrane exposure (eyes) is not a risk and does not recommend eye protection. Skin and respiratory protection are recommended by NIOSH in active fish kill scenarios. For information concerning exposure and risk the following is an opinion by Dr. Thomas Hales, Senior Medical Epidemiologist with the Health Hazard Evaluation Program within NIOSH:

1) What is the risk of skin exposure to the Pfiesteria toxin?

Answer: We are not aware of any data to answer this question. In fact, until the Pfiesteria toxin(s) is identified and characterized, exposure risk assessment is not possible.

2) Is it just dermatitis or is [it] neurological in nature?

Answer: Both are health effects reported to be associated with *P. piscicida*. However, other than some neurocognitive test abnormalities, efforts to document objective evidence of disease among these individuals has been unsuccessful. [Maryland Medical Team 1997] Direct skin contact is considered the pathway for the development of dermatologic symptoms, while the respiratory system is considered the pathway for the development of neurologic symptoms.

For personal protective gear and work practices, we recommend:

- avoiding the contaminated waters whenever possible,
- the use of reusable or disposable waterproof gloves (e.g., nitrile),
- waterproof aprons or rain slickers,
- good personal hygiene practice (e.g., frequent hand washing and showering),
- respiratory protection is discussed below,
- we do not consider the use of eye protection (goggles) necessary at this time because we consider mucous membrane transmission pathway to be unlikely.

3) What type of respiratory protection is required for the Pfiesteria toxin hazard for those working in active fish kills on or over the water?

Answer: Respirator selection is dependent upon several variables:

- Identity and concentration of the particles and/or vapor in the air,
- Occupational exposure limit (e.g., the OSHA PEL, the NIOSH REL, or the ACGIHTLV),
- Hazard ratio (airborne particulate concentration divided by the exposure limit),
- Assigned Protection Factor (APF) for the class respirator,
- Immediately dangerous to life or health (IDLH) concentration,
- Service life information available for combination cartridges or canisters.

For toxins associated with *P. piscicida* or *MRO*, none of these variables are known. This lack of data and the uncertainty of whether there is an associated human health effect, does not provide a scientific basis for using a respirator (i.e., a respirator is not required). However, if community and individual concerns necessitate their use, mask type and filter type would need to be selected.

For aerosol hazards, particulate filter would be appropriate. For hazards in a vapor state, an organic vapor cartridge would be appropriate. Protection from an aerosol and a vapor would require a combination particulate/organic vapor cartridge. Most organic toxins, such as suspected with Pfiesteria, are complex proteins with high molecular weights and low vapor pressures. These characteristics suggest an aerosol exposure, not a vaporous exposure, therefore choosing a particulate filter would be a reasonable approach.

Determination of the proper face piece (full or half-mask) is determined by the required APF or the need for additional eye/face protection. Again, since there are no scientific data on which to base this determination, face piece selection should be based on the individual=s or community=s risk tolerance. If worn properly, a half-mask respirator provides about 90% reduction in exposure, while a full-face respirator provides about a 98% reduction.
The decision whether to supply respirators to potentially exposed workers should be determined by community and individual concerns. Once a decision to provide respirators is made, protection should be the highest level that is practical for the situation. We have discussed this issue with the Occupational Safety and Health Administration (OSHA), specifically with the Office of Occupational Medicine, the Directorate of Federal-State Operations, and the Directorate of Compliance Programs. They recommend a half-mask filtering face piece (dust mask) with a 90% efficient particulate filter (N-95) as a reasonable choice for most situations likely to be encountered by watermen and state workers.

***POLICY***

While the Pfiesteria Safety Committee decided that normal over-the-water work does not result in an exposure to Pfiesteria toxins DSS will make safety equipment available on a voluntary basis. This will be done for those workers who feel uncomfortable with this interpretation. The Division will provide gloves to protect from skin exposure, respirators to protect from respiratory exposure and goggles to protect from eye exposure.

In order to be provided with respiratory safety equipment specific criteria must be met by the individual. Breathing through a respirator requires additional work of the lungs to draw air through the filters. This increased work load on the respiratory system can cause additional stress on the cardiac system. For voluntary use of respiratory equipment the Department of Labor, Occupational Safety and Health Administration rule, 29 CFR parts 1910 and 1926 Respiratory Protection Final Rule states as follows:

**ə1910.134 Respiratory Protection**

(I) An employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard. If the employer determines that any voluntary respirator use is permissible, the employer shall provide the respirator users with the information contained in Appendix D to this section (AInformation for Employees Using Respirators When Not Required Under the Standard≅); and

(ii) In addition, the employer must establish and implement those elements of a written respiratory protection program necessary to ensure that any employee using a respirator voluntarily is medically able to use that respirator, and that the respirator is cleaned, stored, and maintained so that its use does not present a health hazard to the user. Exception: Employers are not required to include in a written respiratory protection program those employees whose only use of respirators involves the voluntary use of filtering facepieces (dust masks).

**Appendix D to ə1910.134 (Non Mandatory) Information for Employees Using Respirators When Not Required Under the Standard**

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator=s limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U. S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else=s respirator.

Based upon ∋1910.134 outlining the voluntary use of respiratory protection, the Division is required to have a respiratory protection plan. If you choose to voluntarily use respiratory protection you will abide by the respiratory protection program. For all uses of respiratory protection VDH/DSS personnel will abide by this plan. This plan is as follows:

## RESPIRATORY PROTECTION PLAN INTRODUCTION

### A. Purpose

The Federal Occupational Safety and Health Administration (OSHA) requirements for respiratory protection are presented in 29 CFR 1910.134 and have been adopted by the Commonwealth of Virginia to assure the protection of all employees from respiratory hazards. The purpose of this plan is to ensure that all Virginia Department of Health/Division of Shellfish Sanitation (VDH/DSS) personnel and visitors are afforded protection from respiratory hazards. The primary objective is to prevent harmful exposures that might result in occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors. This is accomplished, as far as possible, by accepted engineering control measures (for example, general and local ventilation, enclosure or isolation, and substitution of less hazardous processes or materials). When effective engineering controls are not feasible, or while they are being instituted, respirators may be required.

The National Institute for Occupational Safety and Health (NIOSH) guide to respiratory protection, publication No.87-116, as revised or updated, shall be used as an adjunct reference for the implementation of this program. All respirators used by VDH/DSS personnel and visitors must meet criteria of NIOSH and the Mine Safety and Health Administration (MSHA).

All of VDH/DSS are expected to be aware of this program. All VDH/DSS personnel who perform or who may be called upon to perform any work or research activity which will expose them to airborne hazardous or toxic material, or significant amounts of dusts or mists, shall be thoroughly familiar with the contents of this plan.

Copies of the Respiratory Protection Plan are available for review in the following locations: Division of Shellfish Sanitation Richmond Office, White Stone Office, Norfolk Office and Accomac Office.

### B. Scope

This plan covers all staff, and visitors who may become directly or indirectly involved in any activity within the limits of the VDH/DSS geographical areas of responsibility which may require the use of a respirator.

The OSHA requirements as outlined in 29 CFR 1910.134 for an acceptable respiratory protection program include: A written statement of the organization's policy, including assignment of individual responsibility, and authority (authorization) for required activities of the respiratory protection program. Written standard operating procedures governing the selection and use of respirators. Respirator selection (from NIOSH/MSHA approved and certified models) on the basis of hazards to which the worker is exposed. Medical examination of workers to determine whether or not they may be assigned an activity where respiratory protection is required. User training in the proper use and limitations of respirators (as well as a way to evaluate the skill and knowledge obtained by the individual through training). Respirator fit testing. Regular cleaning and disinfecting of respirators. Routine inspection of respirators during cleaning and at least once a month and after each use for those respirators designated for emergency use. Storage of respirators in convenient, clean, and sanitary locations. Surveillance of work area conditions and degree of employee exposure (e.g., through air monitoring). Regular inspection and evaluation of the continued effectiveness of the

program. Recognition and resolution of special problems as they affect respirator use (e.g., facial hair, eye glasses).

**C. Responsibility and Authority**

1. Director

   The Director is responsible for the safety and health of all personnel assigned to VDH/DSS.

2. Director of Field Operations (Safety Officer)

   The Director of Field Operations (Safety Officer) is directly responsible to the Director for the VDH/DSS Respiratory Protection Program and has full authority to make necessary decisions to ensure the success of this program. This authority includes approving equipment purchases necessary to implement and operate the program. The Safety Officer will develop and maintain written detailed instructions covering each of the required elements of this plan, and is the sole person authorized to amend this plan. The Director has expressly authorized the Safety Officer to halt any operation or activity within the VDH/DSS geographical areas of responsibility where there is danger of serious personal injury or illness. This authority includes activities with respiratory hazards. The Safety Officer will provide technical assistance as required and requested to assist field offices in determining the need for respirators, selection of approved/certified respirators, and scheduling of training and qualitative fit testing.

3. Supervisory Personnel

   Supervisory personnel are responsible for ensuring that respirators are available as voluntarily requested or if needed, that personnel assigned to or visiting their areas of responsibility wear respirators if required, for scheduling the inspection of respirators on a regular basis, and for providing the Director of Field Operations with a list of personnel who require initial, semiannual, and annual training or fitting.

4. Each Individual

   Each individual is responsible for using the respirator provided to him or her in accordance with instructions and training, for cleaning, disinfecting, inspecting, and storing his or her respirator, and for reporting any respirator malfunction to his or her supervisor.

5. Safety Officer

   The Safety Officer shall conduct an annual review of the administration and operation of the Respiratory Protection Program. This review shall serve as the basis for recommending changes to the program which will improve its effectiveness. At present the program is voluntary. If mandatory respiratory protection is required in the future, this program will be modified as such.

## RESPIRATOR PROGRAM

### A. General

The purpose of the Respiratory Protection Program is to ensure that viable procedures are established and maintained in accordance with the OSHA requirements mandated in 29 CFR 1910.134 in order to protect the health of all VDH/DSS personnel. The responsibilities for the management of this program are as outlined in paragraph I.C. and subsequent taskings as specified throughout this plan.

### B. Medical Surveillance

OSHA 29 CFR 1910.134(b)(10) states that no one should be assigned a task requiring use of a respirator unless that person is found physically able to do the work while wearing the respirator. Also, OSHA 29 CFR 1910.134(c)(2)(I) states an employer may provide respirators at the request of employees or permit employees to use their own respirators, if the employer determines that such respirator use will not in itself create a hazard. Additionally, some regulatory standards for specific substances and occupations may also contain requirements for medical examinations. Both types of standards declare that a physician should determine what health and physical conditions are pertinent and that respirator wearers' medical status should be reviewed periodically. Ideally pre-placement medical examinations should identify those persons who are physically or psychologically unfit to wear respirators. As another part of the examination, medical tests pertinent to the respiratory hazards which may be encountered should be made to obtain baseline data against which to assess physiological changes in respirator wearers. In addition, the previous medical and employment histories of the individual should be considered.

It is the policy of VDH/DSS that a physician determines if a person should or should not wear a respirator.

All VDH/DSS personnel who choose to wear respirators in their work when they believe they are exposed will be provided medical examinations in accordance with 29 CFR 1910.134 and 29 CFR 1926.58. The medical examinations will be provided free of charge to the individual and will be scheduled during the course of the work day. Records associated with these examinations are maintained in the Division of Shellfish Sanitation Richmond Office and are available upon request by the individual concerned. These records are not available under the Virginia Freedom of Information Act.

### C. Approved Respirators

Only respirators which have been jointly approved by NIOSH and MSHA will be purchased and utilized by VDH/DSS personnel. Approved respirators will be identified by the letters "TC" followed by a series of numbers and letters in the various laboratory equipment catalogs. If in doubt about the approval status of any respirator, contact the Safety Officer. All purchase order requests for the procurement of respirators must be routed through the Safety Officer or designated assistant prior to initiating any purchasing action. It should be noted that a respirator's approval is nullified when components between different types or makes of respirators are mixed, unapproved components are used, or an approved respirator is used in atmospheric concentrations for which it is not approved.

**D. Respirator Selection**

Choosing the right equipment involves several steps: determining what the hazard is and its extent; choosing equipment that is certified/approved for the function; and assuring that the device is performing the function it is intended to perform. Chemical and physical properties of a harmful, irritating, or nuisance airborne material as well as the published Threshold Limit Value (TLV), Permissible Exposure Limit (PEL), or any other available exposure limit or estimate of toxicity for the material and the amount of oxygen present must be considered. The nature and extent of the hazard, work rate, area to be covered, mobility, work requirements and conditions, as well as the limitations and characteristics of the available respirators are selection factors. If a specific standard exists for the hazard (e.g., lead, asbestos) the guidelines or requirements in the standard must be followed.

Although there are many kinds of respirators used for protection, there are two basic types - air purifying and atmosphere supplying respirators.

1. Air Purifying Respirators use filters or absorbents to remove harmful substances from the air. They range from simple disposable masks to sophisticated positive-pressure, blower-operated units. Air purifying respirators may not be used in an oxygen deficient atmosphere or under immediately dangerous to life or health (IDLH) conditions. OSHA defines an IDLH atmosphere as any atmosphere that poses an immediate hazard to life or that poses immediate irreversible debilitating effects on health.

2. Atmosphere Supplying Respirators are designed to provide breathing air from a clean source outside of the contaminated work area. They range from supplied air respirators and self contained breathing apparatus (SCBA) to complete air supplied suits.

The time needed to perform a given task usually determines the length of time for which respiratory protection is needed, including the time necessary to enter and leave a contaminated area. An SCBA or chemical cartridge respirator provides respiratory protection for relatively short periods, whereas an airline respirator provides protection for as long as the face piece is supplied with an adequate quantity of respirable air. For protracted periods of use, positive pressure supplied air respirators offer the advantage of longer use in highly contaminated areas and minimize the need for concern regarding sensory warning properties of the airborne toxic materials. Positive pressure supplied air respirators also cause less discomfort than air-purifying respirators because the wearer need not overcome filter resistance in order to inhale.

Some type of service life warning indicator is available for all SCBA and some chemical cartridge respirators. The warnings usually are an audible alarm based on remaining pressure for SCBA and a color-change indicator for cartridges. The user must understand the operation and limitations of each type of warning device and of each type of respirator. Air-purifying respirators present minimal interference with the wearer's movement while SCBA present size and weight (35 lbs.) penalties.

Only Air Purifying Respirators are available at VDH/DSS for type specific uses. The Safety Officer must be contacted concerning the selection or use of any type of respirator. The VDH/DSS policy is that NO laboratory or maintenance procedure, or work of any sort be undertaken that requires Atmosphere Supplying Respirators.

Negative Pressure Respirators - The air pressure inside the respiratory inlet covering is negative with respect to ambient air during inhalation. Negative Pressure Regulators are the standard half-masks found in most labs and the dust filter masks used by buildings and grounds personnel while cutting grass etc.

Positive Pressure Regulators - The air pressure inside the respiratory inlet covering normally is positive with respect to ambient air pressure.

Powered Air Purifying Respirators - A blower is used to force the ambient atmosphere through high efficiency particulate air (HEPA) purifying elements to the inlet covering. This unit is used for asbestos inspection/removal operations.

The VDH/DSS policy is that NO laboratory or maintenance procedure, or work of any sort that requires any type of respirator above the level of a negative pressure full face piece air purifying type will be performed.

**E. Training**

Selecting the respirator appropriate to a given hazard is important, but equally important is using the selected device properly. Proper use can be ensured only by carefully training both supervisors and individuals in the selection, use and maintenance of respirators. Like the overall Respiratory Protection Program, the content of the training program can vary widely, depending on circumstances. However, 29 CFR 1910.134 requires that training of both supervisors and individuals include the following, no matter what the circumstances:

X An opportunity to handle the respirator

X Proper fitting

X Testing of face piece-to-face seal

X A long familiarizing period of wear in normal air

Furthermore, OSHA requires that the wearer receive fitting instructions including demonstrations and practice in wearing, adjusting and determining the fit of the respirator. Training to support the VDH/DSS Respiratory Protection Program is a tiered system consisting of competent/qualified person, program manager, supervisor, and individual wearer levels as indicated by current federal regulations and American National Standards Institute (ANSI) guidelines. Specific training requirements include:

1. Competent/Qualified Person - This responsibility is assigned to the Safety Officer who will assure that at least one member of the staff has a combination of training and experience sufficient to serve as a Competent or Qualified Person to perform qualitative fit tests and to train others in the use of respirators. When possible the Competent/Qualified person will participate in appropriate training classes and refreshers.

2. Supervisors - OSHA's definition of a supervisor for the purposes of this program is a person who has the responsibility of overseeing the work activities on one or more persons who must wear respirators. The supervisor will participate in a training program, arranged by the Safety Officer that must include the following subjects as a minimum:

X Basic respiratory protection practices

X Nature and extent of respiratory hazards to which persons under his or her supervision may be exposed

X Recognition and resolution of respirator use problems

X Principles and criteria for selecting respirators used by persons under his or her supervision

X Training of respirator wearers

X Fitting and issuance of respirators

X Inspection of respirators

X Use of respirators, including monitoring of use

X Maintenance and storage of respirators

X Regulations concerning respirator use

3. Individual Wearers - To ensure the proper and safe use of a respirator, OSHA requires the following training be provided as a minimum to each individual wearer:

X The need for respiratory protection

X The nature, extent, and effects of respiratory hazards in the workplace

X The need to inform their supervisors of any problems with the respirator or the individual's respiratory system experienced by the individual wearer or by their co-workers

X An explanation of engineering and administrative controls being used and the need for the respirator to provide added protection

X An explanation of why a particular type of respirator has been selected for a specific respiratory hazard and Instructions for inspecting and donning the respirator. This includes a requirement that a fit check shall be performed each time the respirator is donned or adjusted

X Successful completion of a fit test in accordance with applicable standards

X An explanation of how to maintain and store the respirator Instructions in emergency procedures and the use of emergency escape devices (if pertinent)

X Regulations concerning respirator use

4. Persons Issuing Respirators - in the event a person other than the program manager or the supervisor is assigned the task of issuing respirators, OSHA requires that person to receive adequate training to ensure that the correct respirator is issued for each application in accordance with written standard operating procedures.

5. Emergency and Rescue Teams - teams that are established by employers for the purpose of responding to emergencies and/or rescues shall be properly trained in the use of respirators. In addition, a suitable training program shall be established which includes an emergency drill to ensure the proficiency and familiarity of team members to effectively use the respirators while performing such emergency and/or rescue operations.

6. Training Frequency - each respirator user shall be trained upon initial assignment and be retrained once every 12 months unless called for more often as is the case with asbestos, lead, and other type specific programs.

7. Training Records - for each individual, records shall be maintained that give the date and type of training received, performance results (as appropriate), and the instructors name. The records will be held in the Shellfish Sanitation Office in which the employee is assigned

**F. Fit Checks and Fit Tests**

1. Fit Checks

A fit check is conducted by the wearer to determine if the respirator is properly seated to the face. Fit checks are positive and negative pressure tests and are performed before each use and during use if the wearer questions the fit. These tests are used on all respirators with tight fitting face pieces and are conducted as follows:

Positive Pressure Check - Close off the exhalation valve with the palm of the hand and exhale gently into the face piece. The fit is considered satisfactory if slight positive pressure can be built up inside the face piece without any evidence of outward leakage.

Negative Pressure Check - Close off the inlet of the canister, cartridge(s), or filter(s) by covering with the palm(s) of the hand(s) and inhale gently so that the face piece collapses slightly and hold the breath for 10 seconds. If the face piece remains slightly collapsed and no inward leakage is detected, the respirator is probably tight enough.

2. Fit Test

A fit test is conducted with an odor, irritant smoke, or taste challenge agent to evaluate the fit of a respirator to a particular individual. Fit tests are qualitative or quantitative and apply only to tight-fitting respirators which are used in a negative pressure mode. A qualitative fit

test relies on wearers' subjective response to irritation (smoke test), odor (banana oil

test), and taste (saccharin). The Safety Officer will arrange qualitative fit tests with smoke or banana oil. Dust masks will be tested using the saccharin taste test procedure for this type of respirator.

**G. Facial Hair and Fit Tests**

OSHA regulations prohibit facial hair, including beards, sideburns, moustaches, or even a few days growth of stubble, that contacts the portion of the respirator that makes the seal with the wearer's face. Facial hair between the wearer's skin and the sealing surfaces of the respirator prevents a good seal. A respirator that permits negative air pressure inside the face piece during inhalation may allow leakage of asbestos, chemicals or toxins and, in the case of positive pressure devices, will either reduce service time or waste breathing air.

**H. Eye Glasses and Contact Lenses**

Ordinary eye glasses should not be used with full face piece respirators. Eye glasses with temple bars or straps that pass between the sealing surface of a full face piece and the individual's face will prevent a good seal and should not be used. Special corrective lenses can be permanently mounted inside a full face piece respirator and are available from all manufacturers and must be mounted by an individual designated by the manufacturer as qualified to install accessory items.

OSHA is not currently enforcing the no contact lenses rule when wearing any type of full face piece respirator. Contact lenses= wearers should be aware of the potential for incoming air directed toward the eyes causing discomfort from dirt, lint, or other debris lodging between the contact lens and the cornea. Persons working with organic chemicals must be especially alert and wear proper eye protection to avoid the danger of the contact lens becoming stuck to the eye from misting or splashing of the chemicals.

**QUALITATIVE FIT TEST PROTOCOL (BANANA OIL)**

**A. Odor Threshold Screening**

1. Three 1-liter glass jars with metal lids are required.

2. Odor-free water (e.g., distilled or spring water) at approximately 25EC (77EF) shall be used for the solutions.

3. The isoamyl acetate IAA (known as banana oil) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor free water in a 1-liter jar and is shaken for 30 seconds. Stock solutions will not be used if they are more than one week old.

4. The screening test shall be conducted in an area separate from the area used for actual fit testing.

5. The odor test solution is prepared in a second jar by 0.4 ml of the stock solution in 500 ml of odor free water using a clean dropper or pipette. Shake for 30 seconds and allow to stand for two to three minutes so that the IAA above the liquid can reach equilibrium. This solution may be used for only one day.

6. A test blank of 500 ml of odor free water in a third jar.

7. The odor test and test blank jars shall be labeled 1 and 2. The labels/jars shall be changed periodically to maintain the integrity of the test.

8. The following instructions shall be typed on a card and placed on the table in front of the two test jars.

> "The purpose of the test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water.
>
> One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

9. The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

10. If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test may not be used. In that case the irritant smoke fit test will be used.

11. If the test subject correctly identifies the jar containing the test solution, the test subject may proceed to respirator selection and fit testing.

**B. Respirator Selection**

1. The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes.

2. The selection process shall be conducted in an area separate from the fit test area to prevent odor fatigue. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a "comfortable" respirator fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.

3. The test subject holds each face piece up to the face and eliminates those which obviously do not provide a comfortable fit. Normally, selection will begin with a half mask. If a good fit cannot be found with the half mask, the subject will be asked to test the full face piece respirators. A small percentage of users will not be able to wear any half mask.

4. The most comfortable mask is donned and worn at least five minutes to assess comfort. All donning and adjustments of the face piece shall be performed by the test subject without assistance from the test conductor or any other person. If the test subject is not familiar with using a particular respirator, the fit test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

5. Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator: Positioning of mask on nose, Room for eye protection, Room to talk and Positioning mask on face and cheeks

6. The following criteria shall be used to help determine the adequacy of the respirator fit: Chin properly placed, Strap tension, Fit across nose bridge, Distance from nose to chin, Tendency to slip and Self-observation in mirror

7. The test subject shall conduct the conventional negative and positive pressure fit checks before conducting negative or positive pressure test. The subject shall be told to "seat" the mask by rapidly moving the head from side-to-side and up and down while taking a few deep breaths.

The test subject is now ready for fit testing.

**C. Fit Test**

1. The fit test chamber shall be similar to a clear 55 gal. drum liner suspended inverted over a 2-foot diameter frame, so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

2. Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors.

3. After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing site. This site shall be separate from the area used for odor threshold screening and respirator selection, and shall be well ventilated.

4. A copy of the following test exercises and rainbow passage shall be taped to the inside of the test chamber.

Test Exercises - Breathe normally for 1 minute. Breathe deeply for 1 minute. Be certain breaths are deep and regular. Turn head all the way from one side to the other for 1 minute. Inhale on each side. Be certain movement is complete. Do not bump the respirator against the shoulders. Nod head up-and-down for 1 minute. Inhale when head is in the full up position (looking toward ceiling). Be certain motions are complete and made about every second. Do not bump the respirator on the chest. Talk aloud and slowly for several minutes. The following paragraph is called the Rainbow Passage. Reading it out loud will result in a wide range of facial movements and thus be useful in satisfying the requirement.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot at the end of the rainbow.

Jog in place for 1 minute Breath normally for 1 minute

5. Each test subject shall wear the respirator for at least 10 minutes before starting the test.

6. Upon entering the test chamber, the test subject shall be given a 6 inch by 5 inch piece of paper towel or other porous absorbent single ply material, folded in half and wetted with three-quarters of one ml of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

7. Allow two minutes for the IAA test concentration to be reached before starting the fit-test exercises. This would be an appropriate time to talk with the test subject, to explain the fit test, the importance of cooperation, the purpose for the head exercises, or to demonstrate some of the exercises.

8. If at any time during the test the subject detects the banana like odor of the IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

9. If the test has failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber and repeat the above test steps. The subject shall wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

10. If a satisfactory fit test cannot be achieved with a half-mask respirator from the available selection, full face piece models must be used.

11. When a respirator is found that passes the test, the subject breaks the face seal and takes a breath before exiting the chamber; the subject should smell the banana oil at this time. This step is to assure that it was the respirator and not olfactory fatigue that prevented the individual from smelling the IAA during the fit test.

12. When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the area from becoming contaminated, the used towels shall be kept in a self-sealing bag so there is no significant buildup in the test chamber during subsequent tests.

13. The test subject shall be given the opportunity to wear the respirator for one week to assure a comfortable fit. Should the fit not be satisfactory, an attempt will be made to find another suitable respirator.

14. Persons who have successfully passed this test with a half-mask respirator may be assigned the use of the test respirator in atmospheres which do not require a protection factor (PF) greater than 10.

15. The test shall not be conducted if there is any hair growth between the skin and the face piece sealing the surface.

16. If hair growth or apparel interferes with a satisfactory fit, they shall be altered or removed so as to eliminate interference and allow a satisfactory fit. If a satisfactory fit is not attained, the test subject must use a positive-pressure respirator such as a powered air-purifying respirator or SCBA.

17. If a test subject exhibits difficulty in breathing during the tests, he or she shall be referred to a physician with experience in respirator diseases or pulmonary medicine to determine whether the test subject can wear a respirator while performing her or his duties.

18. Qualitative fit testing shall be repeated annually except for type specific programs such as asbestos and lead which require fit testing every 6 months. In addition qualitative fit testing shall be repeated immediately when the respirator user experiences a change which may affect the sealing of the respirator. The following are examples of such changes: Weight change of 20 pounds or more Significant facial scarring in the area of the face piece seal Significant dental changes; i.e.,; multiple extractions without prothesis, or acquiring dentures Reconstructive or cosmetic surgery of the face or neck Any other condition that may interfere with face piece sealing.

## RECORD KEEPING

A summary of all test results shall be maintained for a period of not less than three years.

## RESPIRATOR CLEANING

Respirators must be cleaned and disinfected regularly. Those issued for the exclusive use of one individual will be cleaned after each day's use or more often, if necessary. Those used by more than one individual will be thoroughly cleaned and disinfected after each use. The manufacturer's instructions, if any, for cleaning should be followed.

Any good detergent or cleaner and sanitizer solutions that clean effectively and contain a bactericide. A stiff bristle (not wire) brush may be used to facilitate removal of dirt or other foreign material.

An alternative method of cleaning and disinfection is washing the respirator in detergent followed by a disinfecting rinse. Disinfection is not absolutely necessary if the respirator is reused by the same person. Reliable, effective disinfectants may be made from readily available household bleach by adding 2 ml of bleach to 1 L of water or 2 tablespoons of bleach to 1 gallon of water. A 2-minute immersion disinfects the respirators.

To avoid damaging the rubber and plastic face pieces, the cleaner and disinfectant temperatures should not exceed 140EF (48EC) but they should be not less than 120EF (60EC) to ensure adequate cleaning. The cleaned and disinfected respirators should be rinsed thoroughly in clean water to remove all traces of detergent, cleaner, sanitizer, and disinfectant. This is very important to prevent dermatitis.

The respirators may be allowed to dry by themselves on a clean surface. They also may be hung from a horizontal wire, like drying clothes, but care must be taken not to damage face pieces. The clean dry respirator should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The most common item found during the inspection is detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

## RESPIRATOR INSPECTION

Respiratory equipment will be inspected for defects before and after each use and during cleaning. The primary defects to look for in the inspection of component parts, and the appropriate corrective actions areas follows:

A. Air-purifying respirators (half-mask and full face piece)

1. Rubber face piece: Excessive dirt (clean) Cracks, tears, or holes (obtain new face piece) Distortion (replace)

2. Head straps - Breaks or tears (replace), Loss of elasticity (replace), Broken or malfunctioning buckles or attachments (replace), Face piece slips (replace straps).

3. Inhalation and Exhalation valves - Detergent residue, dust particles or dirt on valve seat (clean), Cracks, tears or distortion in the valve material or valve seat (replace respirator), Missing or defective valve cover (replace)

4. Filter element(s) Proper filter for the hazard Approved design - Missing or worn gaskets (replace), Worn filter or face piece threads (replace filter or face piece), Crack or dents in filter housing (replace filter), Old or dirty filters (replace).

B. Respirator Repairs

1. The OSHA standards state that "replacement or repairs shall be done by experienced persons with parts designed for the respirator.≅ Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device. Therefore, the user would be wearing an unapproved device, in violation of the OSHA requirement and, perhaps more importantly, at increased risk of exposure to the hazards for which the mask is being worn.

2. Any respirator found to have missing or defective parts shall be turned in to the Office of Safety and Environmental Programs repair or replacement.

## RESPIRATOR STORAGE

All the care that has gone into cleaning and maintenance of a respirator can be negated by improper storage. OSHA requires that respirators be stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals. In addition, the respirator must be protected against mechanical damage. Leaving a respirator unprotected, as on a workbench or in a tool cabinet or tool box among heavy wrenches, may damage it.

Freshly cleaned respirators shall be placed in sealable plastic bags until needed. They should be stored in a clean, dry location away from direct sunlight. They should be stored in a single layer with the face piece and exhalation valve in a more or less normal position to prevent the rubber or plastic from taking a permanently distorted set.

## WORK AREA SURVEILLANCE

Supervisors or designated and competent persons will maintain surveillance of conditions in the work area and degree of worker exposure or stress (combination of work rate, environmental conditions, and physiological burdens of wearing a respirator). Changes in operating procedures, temperature, movement of air, humidity, and work practices may influence the concentration of a substance in the work area's atmosphere. These factors might necessitate periodic monitoring of the air contaminant concentration to assure that concentrations have not risen above the maximum protective capability of the respirator being used.

## PROGRAM INSPECTION

The Safety Officer will conduct inspections to ensure that all respiratory protection equipment is working properly at all times. The inspection will include, but not be limited to, the following: Approved respirators are used, Respirators are properly worn, Respirators are clean and in good repair, An adequate supply of replacement parts are kept on hand, Respirator wearers are consulted about discomfort, fatigue, resistance on breathing, interference with vision or communications, restriction of movement or job interference, confidence in respirators and medical status.

## PLAN REVIEW

Review of this plan will be coordinated by the Safety Officer. Suggestions from all VDH/DSS personnel in particular respirator users, are welcome at any time. Emergent changes that can not be held until the annual review due to their potentially adverse impact if not promulgated in a timely manner shall be distributed as necessary.